REMARKS / ARGUMENTS

In the Specification, the U.S. Patent Application Serial Number 09/979,588 has been corrected to: 08/979,588. The objection to the Specification is deemed to be overcome.

In the Original Claims, the previously submitted new claims 121-156 have been renumbered as new claims 122-157, and the originally filed claims 1-121 have been canceled. Accordingly, all objections to the claims have been addressed and corrected. Consequently, the objections to the claims are deemed to be overcome.

The claims have been objected to regarding the claim numbering, and such claim numbering has been corrected. Claim 125 has been renumbered as claim 126, which now does NOT depend from itself, instead referring to a preceding claim. Moreover, claim 154 (previously claim 153) has been amended to include a period.

Claim 147 (previously claim 146) has been rejected under 35 USC 112, second paragraph. Claim 147 has been therefore amended so as to make more clear that the "additional information" is in fact "a plurality of vectors, each vector

indicating a distance and direction towards the at least one chain of pattern boundary points". Accordingly, the rejection of claim 147 under 35 USC 112, second paragraph is deemed to be overcome.

Claims 148-157 have also been rejected due to their dependence upon claim 147, and therefore, the rejection of claims 148-157 under 35 USC 112, second paragraph is also deemed to be overcome.

Claims 122-125 and 134 have been rejected under 35 USC 102(b) as being anticipated by Gee et al. (5,459,636) ("Gee").

Regarding claim 122, Applicant claims a method of <u>training</u> a model pattern, which means "building" or "creating" a model pattern. "Training" occurs at "train-time", whereas <u>using</u> a model pattern occurs at "run-time". During "run-time", the resulting trained model pattern from 'train-time" is used to find an object using a geometric pattern matching method. The result of Applicant's method of training a model pattern includes both "**boundary points**", as well as "**information about the boundary points** for inclusion in said model pattern, the information being stored as a function of position within a region of the image that includes the boundary points". Such a model that combines "boundary points" with "information about the boundary points" as set forth in claim 122 is then used as a model in geometric pattern matching, which can be used to find a model pattern within an image.

By contrast, Gee teaches merely a model 24 (see Fig. 3) having only a single set of boundary points (see col. 4, lines 14-16). That model data 24 is iteratively compared with edge data 23 in an image, the results of comparing being used to create a set of input vectors 25 to a neural net 26, the output of which informs an adjustment module 27 as to how to adjust the values of all the boundary points of the single set of boundary points to better match the edge data 23. The result of each iteration is merely another model, having only a single set of ADJUSTED boundary points. Each iteration produces a better adjusted model, but still having only a single set of boundary points.

By contrast, Applicant's model stores the original boundary points **along with** information that is "stored as a function of position within a region of the image that includes the boundary points".

The minimum distance vectors are NOT a part of the model 24. They merely arise due to a comparison of the model data 24 with the edge data 23 of the image. In fact, the minimum distance vectors are an intermediate result in a pattern matching process, and are INPUT TO THE NEURAL NETS for performing pose estimation in step 26 of Fig. 3. The neural nets then provide information to an adjustment module 27 which changes the pose of each boundary point of the model data 24. Thus, the minimum distance vectors of step 25 result in the model data 24 changing value accordingly, but are NOT "for inclusion" in the model pattern, such that the information is "stored as a function

of position within a region of the image that includes the boundary points", as required by claim 122.

Further Fig. 3 clearly shows that the edge data 23, the model data 24, and the minimum distance vector calculation results 25 are all quite distinct. Moreover, Fig. 3 does NOT show that the minimum distance vector calculation results 25 are "included" in the model data 24. Accordingly, the rejection of claim 122 is deemed to be overcome.

Regarding claim 123, the Examiner cites col. 5, lines 17-47, which relate to the position and orientation adjustment module 27. Claim 123 requires that "the information is <u>stored</u> as a function of real-valued position within the region of the image that includes the boundary points." By contrast, Gee instead CHANGES the position of the points of the model data 24. Moreover, Gee merely teaches INTEGER adjustments to position, whereas Applicant clearly requires REAL-VALUED, i.e., NOT restricted to integer values. Further, claim 123 depends on claim 122, herein deemed to be allowable. Accordingly, the rejection of claim 123 is deemed to be overcome.

Regarding claim 124, the Examiner cites col. 4, line 37 – col. 5, line 47. However, claim 124 requires that "the information is stored at discrete points on a grid using a two-dimensional array". Gee does NOT show storing the minimum distance vectors 25, and does not show a grid for storing the minimum distance vectors 25. Fig. 5 is the only figure that shows minimum distance vectors, and in

fact it shows that the X and Y data from these vectors is sent to module 26, which is NOT a storage module, but a calculation module called a neural net. Moreover, claim 124 depends from claim 122, herein deemed to be allowable. Accordingly, the rejection of claim 124 is deemed to be overcome.

Regarding claim 125, referring to Fig. 5, a point P_m is used to calculate a minimum distance vector. Presumably, each point of the model 12 is used to calculate a minimum distance vector. Each such minimum distance vector originates **on** a point P_m. By contrast, claim 125 requires "information that is a vector-valued function of position **within the region** of the image that includes the boundary points". Thus, in Applicant's invention, the vectors do NOT originate on model points, whereas in Gee, they DO originate on model points. The claim language of 125 makes this distinction. Moreover, claim 125 depends from claim 122, herein deemed to be allowable. Accordingly, the rejection of claim 125 is deemed to be overcome.

Regarding claim 134, one of average skill in the art of machine vision would interpret "neighboring boundary points" to be points along a boundary WITHIN the model 12, NOT other points that are not boundary points, such as edge data points 23 of the object 11. Thus, determining minimum distance vectors does NOT inherently involve determining which points of the boundary of the model 12 are neighbors of each other. Further, claim 134 depends from

claim 122, herein deemed to be allowable. Accordingly, the rejection of claim 134 is deemed to be overcome.

Claims 130-131, 135, 142, 144 and 146 have been rejected under 35 USC 103(a) as being unpatentable over Gee, et al. (5,459,636) ("Gee") in view of Irie, et al. (5,555,320) ("Irie").

Irie, in Fig. 4, shows a graph of an exemplary feature vector distribution D. One of average skill in the art of machine vision knows that a feature vector **distribution** is NOT a **chain** of boundary points. Irie never connects an individual feature vector with another individual feature vector. The only relationship that each feature vector in Irie has to a neighboring feature vector is membership in the feature vector distribution D.

Even more basic, is that a feature vector is not analogous to a boundary point. A feature vector exists in a multi-dimensional feature space, whereas a boundary point exists in a two-dimensional image space.

Consequently, one of average skill in the art of machine vision would never combine Irie with Gee, since the boundary points in Gee are in two-dimensional image space because the references teach away from such combining. Even if one could combine Irie with Gee, Gee would not remedy the deficiencies in Gee as explained herein above. Thus, there is nothing in either reference that would teach, suggest, or motivate combining them. Accordingly, the rejection of claims 130-131, 135, 142, 144 and 146 has been overcome.

Claims 147-148 and 155 are rejected under 35 USC 103(a) as being unpatentable over Irie et al. (5,555,320) ("Irie").

Irie, in Fig. 4, shows a graph of an exemplary feature vector distribution D. One of average skill in the art of machine vision knows that a feature vector **distribution** is NOT a **chain** of boundary points. Irie never connects an individual feature vector with another individual feature vector. The only relationship that each feature vector in Irie has to a neighboring feature vector is membership in the feature vector distribution D.

Even more basic, is that a feature vector is not analogous to a boundary point. A feature vector exists in a multi-dimensional feature space, whereas a boundary point exists in a two-dimensional image space. Accordingly, the rejection of claims 147-148 and 155 is overcome.

The prior art made of record and not relied upon does not appear to present an impediment to the allowance of the present application.

Accordingly, Applicants assert that the present application is in condition for allowance, and such action is respectfully requested. The Examiner is invited to phone the undersigned attorney to further the prosecution of the present application.

Respectfully Submitted,

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